

## Supercritical fluid extraction of oil from Andean Lupin seeds

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### Introduction

Andean Lupin (*Lupinus mutabilis*, tarwi) is a legume plant widely grown in marginal lands for the enrichment of soil and as a food crop. Lupin beans are widely known for their overall interesting nutritional value for human food and animal feeding. The useful quantities of oil stored in lupin seeds have not been exploited and has the potential to serve as a source of oil (edible) to compete with the available source of oil (e.g. soybeans) in the market.

Extraction of oils can be readily accomplished via supercritical fluid extraction (in this study supercritical carbon dioxide is used), which is an alternative extraction method eliminating the use of toxic and flammable solvents. The optimization of the various parameters that affect the oil extraction from Andean Lupin seeds are to be examined in this study.

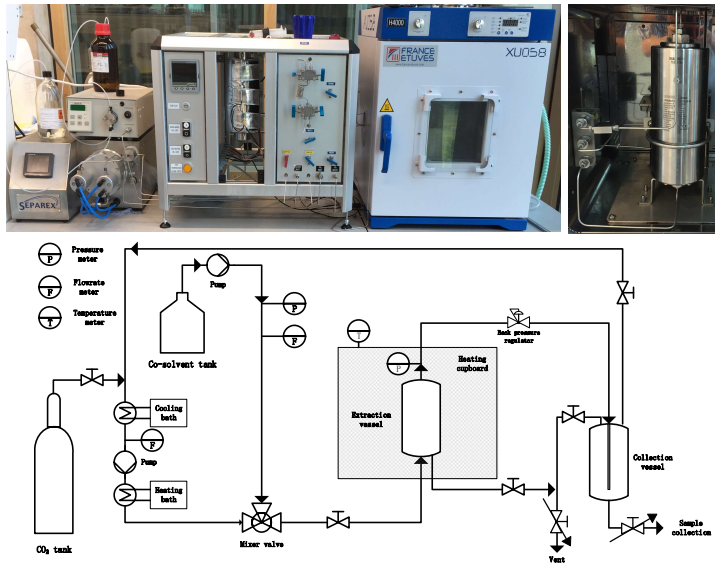


Andean Lupin

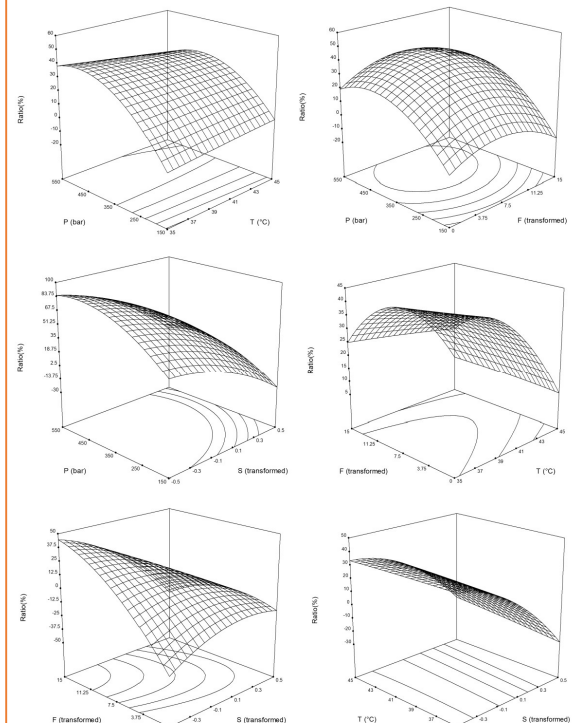


Andean Lupin seeds

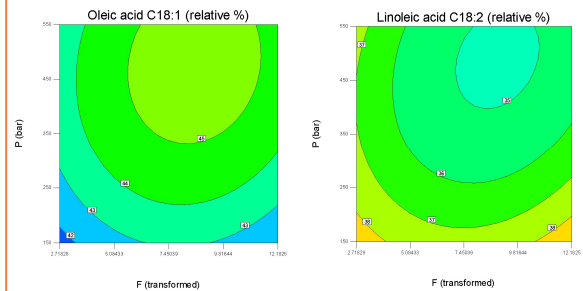
### Supercritical carbon dioxide (scCO<sub>2</sub>) extraction process



### Response surface plot of scCO<sub>2</sub> oil extraction from lupin seeds

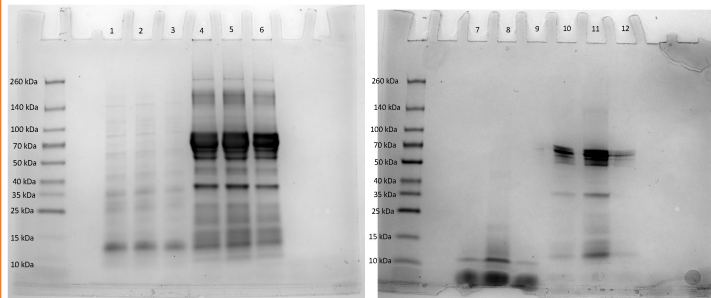


The ratio (%) of oil extracted from lupin seeds up to 5 h for various pressure (P), flow rate (F), temperature (T) and sample mesh size (S).



The ratio (relative, %) of Oleic acid and Linoleic acid in the extracted oil from lupin seeds for the 1 h at various pressure (P) and flow rate (F).

### SDA-PAGE lupin seed protein before & after oil extraction



The columns 1, 4, 7 and 10 stand for the albumin, globulin, prolamin and glutelin respectively in the untreated lupin seeds; 2, 5, 8 and 11 the types of proteins in lupin seed samples defatted via scCO<sub>2</sub> extraction; 3, 6, 9 and 12 the proteins respectively in the lupin seed defatted via Soxhlet extraction. Denaturation occurs to lupin protein after Soxhlet oil extraction.

### Conclusion and outlook

About 80% oil can be collected after five-hour scCO<sub>2</sub> extraction compared to conventional Soxhlet extraction. The pressure and the sample mesh size influence more the amount of extracted oil than the temperature and scCO<sub>2</sub> flow rate. There was a correlation of the ratio of fatty acids in the extracted oil sample to the operating parameters (e.g. pressure and flow rate). The lupin protein is maintained after scCO<sub>2</sub> extraction, while suffer denaturation after Soxhlet extraction. More efforts are required to collect more theoretical, literal or experimental support for the obtained results.

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